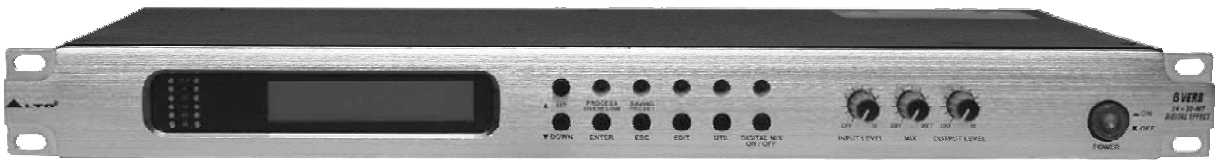
User's Manual

βVERB

24×32 BIT DIGITAL EFFECTS



ALTO®

www.altoproaudio.com

Version 2.2 August 2004

— English —

SAFETY RELATED SYMBOLS

This symbol, wherever used, alerts you to the presence of un-insulated and dangerous voltages within the product enclosure. These are voltages that may be sufficient to constitute the risk of electric shock or death.

This symbol, wherever used, alerts you to important operating and maintenance instructions. Please read.

⏚ Protective Ground Terminal

~ AC mains (Alternating Current)

Hazardous Live Terminal

ON: Denotes the product is turned on.

OFF: Denotes the product is turned off.

WARNING

Describes precautions that should be observed to prevent the possibility of death or injury to the user.

CAUTION

Describes precautions that should be observed to prevent damage to the product.

WARNING

• Power Supply

Ensure that the mains source voltage (AC outlet) matches the voltage rating of the product. Failure to do so could result in damage to the product and possibly the user.

Unplug the product before electrical storms occur and when unused for long periods of time to reduce the risk of electric shock or fire.

• External Connection

Always use proper ready-made insulated mains cabling (power cord). Failure to do so could result in shock/death or fire. If in doubt, seek advice from a registered electrician.

• Do Not Remove Any Covers

Within the product are areas where high voltages may present. To reduce the risk of electric shock do not remove any covers unless the AC mains power cord is removed.

Covers should be removed by qualified service personnel only.

No user serviceable parts inside.

• Fuse

To prevent fire and damage to the product, use only the recommended fuse type as indicated in this manual. Do not short-circuit the fuse holder. Before replacing the fuse, make sure that the product is OFF and disconnected from the AC outlet.

• Protective Ground

Before turning the product ON, make sure that it is connected to Ground. This is to prevent the risk of electric shock.

Never cut internal or external Ground wires. Likewise, never remove Ground wiring from the Protective Ground Terminal.

• Operating Conditions

Always install in accordance with the manufacturer's instructions.

To avoid the risk of electric shock and damage, do not subject this product to any liquid/rain or moisture. Do not use this product when in close proximity to water.

Do not install this product near any direct heat source.

Do not block areas of ventilation. Failure to do so could result in fire.

Keep product away from naked flames.

IMPORTANT SAFETY INSTRUCTIONS

Read these instructions

Follow all instructions

Keep these instructions. Do not discard.

Heed all warnings.

Only use attachments/accessories specified by the manufacturer.

• Power Cord and Plug

Do not tamper with the power cord or plug. These are designed for your safety.

Do not remove Ground connections!

If the plug does not fit your AC outlet seek advice from a qualified electrician.

Protect the power cord and plug from any physical stress to avoid risk of electric shock.

Do not place heavy objects on the power cord. This could cause electric shock or fire.

• Cleaning

When required, either blow off dust from the product or use a dry cloth.

Do not use any solvents such as Benzol or Alcohol. For safety, keep product clean and free from dust.

• Servicing

Refer all servicing to qualified service personnel only. Do not perform any servicing other than those instructions contained within the User's Manual.

PREFACE

Dear Customer:

Thanks for choosing ▲LTO βVERB and thanks for choosing the one of results of the ▲LTO AUDIO TEAM job and researches.

For our ▲LTO AUDIO TEAM, music and sound are more than a job...are first of all passion and let us say...our obsession!

We have been designing professional audio products for a long time in cooperation with some of the major brands in the world in the audio field.

The ▲LTO line presents unparalleled analogue and digital products made by Musicians for Musicians in our R&D Centers in Italy, Netherlands, United Kingdom and Taiwan. The core of our digital audio products is a sophisticated DSP (Digital sound processor) and a large range of state of the art algorithms which have been developed by our Software team for the last 7 years.

Because we are convinced you are the most important member of ▲LTO AUDIO TEAM and the one confirming the quality of our job, we'd like to share with you our work and our dreams, paying attention to your suggestions and your comments.

Following this idea we create our products and we will create the new ones! From our side, we guarantee you and we will guarantee you also in future the best quality, the best fruits of our continuous researches and the best prices.

Our ▲LTO βVERB is the result of many hours of listening and tests involving common people, area experts, musicians and technicians.

The result of this effort is the realization of effects such as reverb, chorus, flanger and delay that are today the best guitar amplifiers and studio equipment in the world, effects that we collected in our single rack unit, efficient and easy to use ▲LTO βVERB.

Nothing else to add, but that we would like to thank all the people that made the ▲LTO βVERB a reality, available to our customers ,and thank our designers and all the ▲LTO staff, there to make possible the realization of products containing our idea of music and sound and there to support you, our customers, in the best way, conscious that you are our best richness.

Thank you very much.
▲LTO AUDIO TEAM

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1. INTRODUCTION

Purchasing ▲LTO βVERB, you purchased a very powerful effect processor, easy to use and contained in a very efficient rack package.

▲LTO βVERB is divided in 9 effects algorithms and for each of them there are several factory presets so to reach totally 64 factory presets that can be used as starting point to create 64 customer's presets storable into 64 available memory locations. The powerful Editing section of the βVERB allows the users to modify the presets accessing a huge number of parameters defining the algorithms.

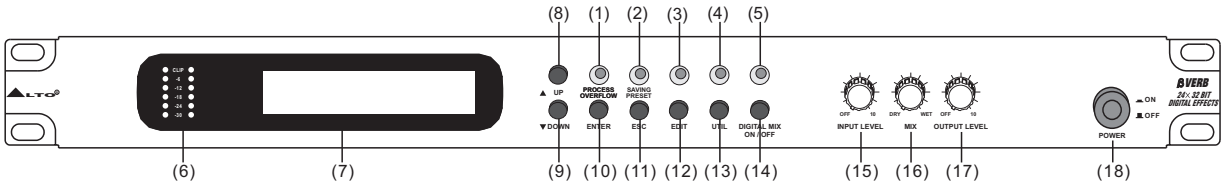
All the algorithms are based on classical algorithms for the effects generation and environment response modelling, modified and optimized, thank the experience of ▲LTO AUDIO TEAM researchers.

2. FEATURE LIST

- Robust and Compact Design
- 24/32 bits Digital Audio Processor
- MPU Control
- Variable Input Output Gain
- Illuminated Power Switch
- Digital Saturation LED
- Easy to Operate Front Panel Controls and Display
- SMT Design for Greater Reliability
- Optimized Signal Path to Provide Superior Sound
- Manufactured Under QS9000, VDA6.1 Quality System

3. FRONT AND BACK PANELS DESCRIPTION

3.1 Control Panel (Front Panel)



a. Program and Variation Selections

(1) Digital Overflow LED
(2) Saving Preset LED
(3) Edit LED
(4) Utility LED
(5) Digital Mix ON / OFF LED
(6) VU-Meter
(7) LCD Display 20×2 alphanumeric
(8) Up key
(9) Down key
(10) Enter key
(11) Esc key
(12) Edit key
(13) Utility key
(14) Digital Mix ON / OFF key
(15) Analog Input volume
(16) Dry/Wet Mix Potentiometer for Analog Dry/Wet Mixing
(17) Analog Output gain
(18) Power ON/OFF Switch

b. Analog levels

- Analog Input Level Potentiometer (15): The input level control sets the main input gain, before the signal reaches the input bus. It controls both the Input1 and Input2 levels simultaneously.

- Dry/Wet Mix Potentiometer for Analog Dry/Wet Mixing (16): This potentiometer represents one of the most powerful features of βVERB. βVERB offers the possibility to mix Dry and Wet signals digitally or analogically. When Digital Mix ON/OFF key is pressed and the related Digital Mix ON/OFF LED is on (red), βVERB is allowing the Dry/Wet digital mixing with the chosen percentages operated by "%dir" and "%eff" functions available within "EDIT MENU". When Digital Mix ON/OFF is on, the analog mix potentiometer must be positioned on fully Wet, When Digital Mix ON/OFF is off (Digital Mix ON/OFF LED is turned off), the Dry/Wet Mix Potentiometer for Analog Dry/Wet Mixing (16) can be used to analogically adjust the balance between the Dry signal coming into the input and the Wet one coming from βVERB after the effect's digital process.

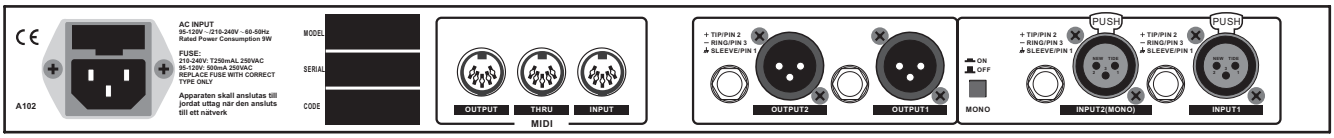
- Analog Output Level Potentiometer (17): The output level control set the level going to the amplifier or mixer from this apparatus.

c. LED and Illuminated Power Switch

- Digital Saturation LED (1): Displays the signal level coming into the input during normal operation, if the signal level is too high, this LED will turn red and you will begin to hear the signal distortion.

- Power On/Off Switch (18): Turns the apparatus on and off.

3.2 Analog Connections (Rear Panel)



a. Analog Inputs/Outputs

- INPUTS: These are 1/4" TRS and XLR balanced connectors which connect to sources such as the effects sends of mixing console. They may be used with nominal input levels from consumer to professional audio. For mono application, use the INPUT2, once set manually the MONO ON/OFF switch to ON.
- OUTPUTS: These are 1/4" TRS and XLR balanced connectors which connect to devices such as the effects returns on a mixing console or power amplifier inputs. For Mono applications, use the OUTPUT1 or the OUPUT2 and the OUTPUT2 once set manually the MONO ON/OFF switch to ON.
- MONO ON/ OFF switch: this switch sets the operational mode, switch to ON for mono application.

b. MIDI Connectors

- MIDI IN: DIN connector for the MIDI input to the βVERB.
- MIDI THRU: DIN connector for the MIDI thru.
- MIDI OUT: DIN connector for the MIDI output from the βVERB.

c. Power Connector

- POWER CONNECTOR: This is the plug for connecting the power supply to the βVERB.

4. INSTALLATION & CONNECTION

4.1 Audio Connections and Power Up

a. Audio Connections

The connections between the βVERB and the other audio devices have to be made using high quality cables so to prevent bad performances of the βVERB itself. So it should be good to use low-capacitance shielded cables with a flexible internal conductor. Connect the cables to the βVERB properly by observing the following precautions:

- Do not bundle audio cables with AC power cords.
- Avoid place audio cables and βVERB, near sources of electromagnetic interference such as transformers, monitors, computers, etc.
- Always unplug cables by firmly grasping the body of the plug and pulling directly outward.
- Do not place cables where they can be stepped on.
- Avoid twisting a cable or having it make sharp, right angle turns.

b. Power Up Setting

After making your connections, turn on the system power using this procedure:

Before turning on the βVERB power, check if:

- All connections been have made correctly.
- The volume controls of the amplifier or mixer are turned down.

Insert the Power plug into the POWER input on the rear panel of the βVERB and plug the power cord into an AC outlet.

Turn on the power of the βVERB, pushing the ON/OFF button on the front panel.

Turn on the power of the amplifier/mixer, and adjust the volume.

4.2 Analog

a. Levels Setting

Proper setting of the input and output levels is crucial in order to achieve the maximum signal-to-noise ratio. It is possible to say that it is usually best to set both input and output level controls at 3/4 or 75% of full. This will decrease the possibility of overload distortion and keep the amount of background noise to a minimum.

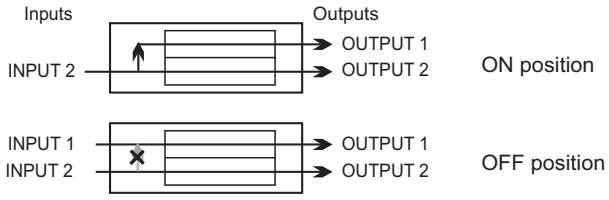
If the VU-Meters or the Digital Saturation LED on the βVERB begin to clip (turn red), turn down the Input level or decrease the volume of the source (instrument, mixer send, etc.). If the output level is causing the mixer or amp to distort, turn the Output Level down.

4.3 Installation

a. Mono Use of βVERB

The βVERB's INPUT 2 can be used as MONO input when necessary setting in the proper way the switch MONO ON/OFF on the back panel of βVERB itself.

When the MONO ON/OFF switch is manually set to ON position, physically the INPUT 2 will be routed also on the internal INPUT 1 line.



When the MONO ON/OFF switch is set to OFF position, the INPUT 2 is no more routed on the INPUT 1 line and βVERB works in fully stereo configuration and MUST have stereo input signals for a proper functioning of the process algorithm.

When the input signal is mono, it has to be connected to the INPUT 2 and the MONO ON/OFF switch MUST be set to ON.

b. Standard Use

The βVERB may be placed almost anywhere: on a table, on top of an amp, next to a mixing console. If it will be on furniture, check the rubber feet provided to the bottom of the unit. Make sure to place the βVERB away from other audio equipment that may induce fields, and away from the signal wiring. It is possible that βVERB may pick up noise fields generated by other equipment such as large power amplifiers; in this case, move the βVERB until the noise goes away.

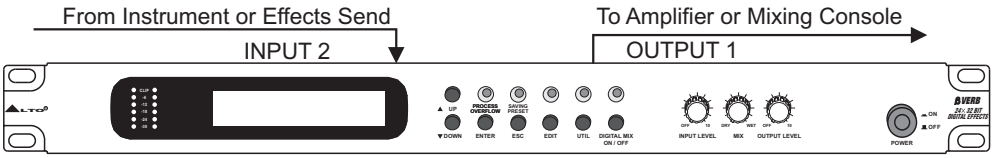
c. Application Examples

- LINE INSTRUMENT

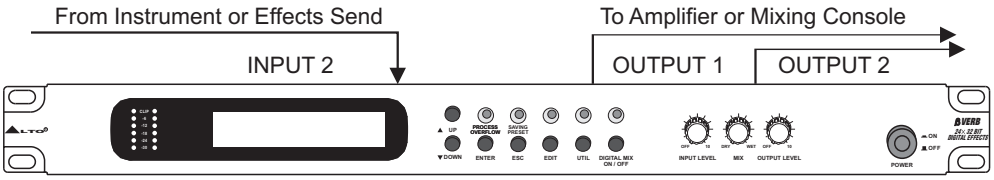
When connecting audio cables and/or turning power on and off, make sure that all devices in your system have their volume controls turned down.

βVERB has four inputs (two 1/4" TRS inputs and two XLR balanced inputs) and four outputs (two 1/4" TRS outputs and two XLR balanced outputs) allowing the βVERB to be used in a classical Stereo in and Stereo Out connection or in Mono configuration as described above.

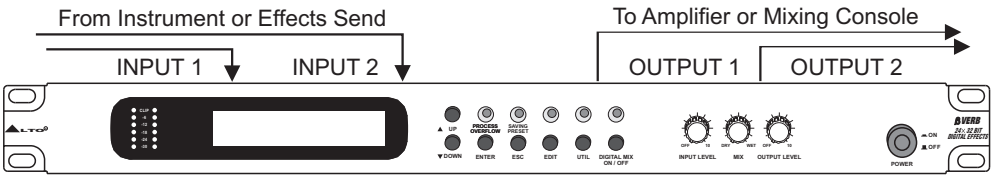
• **MONO.** Set manually the MONO ON/OFF switch to position ON. Connect one audio cable to the INPUT 2 of the βVERB from a mono source, and one or two other audio cables from the OUTPUT 1 and OUTPUT 2 of the βVERB to a mono/stereo amplification system or one/two mixer inputs.



• **MONO IN, STEREO OUT.** Again set manually the MONO ON/OFF switch to position ON. Connect one audio cable to the INPUT 2 from a mono source, and now two other audio cables from the OUTPUT 1 and OUTPUT 2 of the βVERB to a stereo amplification system or two mixer inputs.



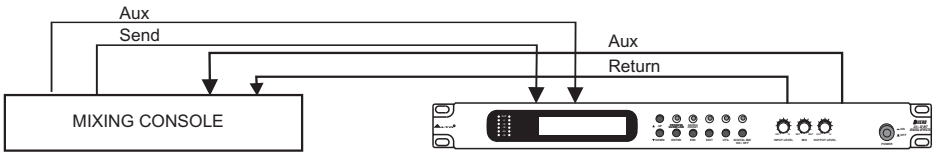
• **STEREO.** Set manually the MONO ON/OFF switch to position OFF. Connect two audio cables to the INPUT 1 and INPUT 2 of the βVERB from a stereo source, and two other audio cables from the OUTPUT 1 and OUTPUT 2 of the βVERB to a stereo amplification system or two mixer inputs.



- MIXER

Interfacing to a Mixing Console

The βVERB can accept mono or stereo sends at all system levels. The input circuitry of the βVERB can easily accept professional levels while having enough input and output gain to interface with the low signal levels of home recording systems.



The βVERB may be connected to a mixing console using Aux sends and returns. Another way of interfacing the βVERB to a mixer or recording console would be in-line between the output of your mixing console and the input of a tape deck or power amplifier. This last setup would be used only if you wanted to effect the entire mix.

Using Aux Sends and Returns

Generally, on mixing consoles are available two types of auxiliary sends: pre-fader sends (headphone or monitor), and post-fader sends for effects units. Typically, if a mixer has more than two sends per channel (4, 6 or 8, perhaps), the first two sends are reserved for the pre-fader sends, while the remaining sends are used to send the signal to be effected to devices as the βVERB. Connect the βVERB using post-fader sends, so fading a channel out, its effects will fade also.

Using a mixer's aux sends allows each channel to have its own level control going to the aux output. It is possible to mix all the channels we want to be sent to the effects by using the individual channels' aux send levels on the mixer. Most consoles also have aux master controls, which set the overall level of each aux output.

Sending signal to the βVERB is only half of the process. With a mixing console, the output of the βVERB must go back to the mixer and turned up in the mix before to be able to hear it. Depending from the mixer, there are two options for returning the effected signal to the mix:

- connecting to dedicated aux return inputs, or
- connecting to channel inputs.

Everything is easy if the mixer provides dedicated inputs (called returns) for effect devices like the βVERB. If the mixer does not have these, or the available returns have already been used all, it possible to connect the βVERB to channel inputs (if there are any remaining). The effect returns generally should only contain effected signal, and not have any unaffected or "DRY" signal mixed with it (since these two signals are blended together at the mixer). Therefore, it is necessary to set the mix so that only effected ("WET") signal is present at the βVERB's outputs. To do this, turn the Mix control all the way to the right.

MONO IN - STEREO OUT.

If you only want to use the βVERB for a mono input signal and to connect both of its outputs back to the mixer, you will need three audio cables. Connect an audio cable from an effect send to the INPUT 2 of the βVERB once set the MONO ON/OFF switch to ON and another 2 audio cable from the OUTPUT 1 and OUTPUT 2 outputs of the βVERB to a couple of effect return or other mixer inputs. On the reverb effect βVERB creates a stereo output, even though only a single input is used.

STEREO IN - STEREO OUT.

This connection is similar to the one described above. However, by utilizing two sends from the mixer, we have to use one more audio cable to send a stereo signal to the βVERB's inputs. The use of a stereo input is especially useful on the true stereo reverb program.

HOW TO SET AUX SEND AND RETURN LEVELS ON THE MIXER.

In the above connections, it is necessary to set proper levels on the mixer's individual Aux Sends, Aux Masters, and Aux Return masters (as well as the βVERB's own controls) to get good, clean, quiet results.
Improper level setting is the most common cause of noise and distortion problems.
By having the correct level at every point in the send/return chain, it is possible to avoid overloading distortion and minimize noise. The most common mistake using effect units like the βVERB is to have too low the input signal level and to increase too much the output level to compensate the input and reach the desired effects level: this amplifies the noise, reducing headroom. Here is a procedure that will give good results with most standard equipment:

1. Set the mixer's input levels correctly.
2. Turn up the mixer channels' AUX SEND and AUX MASTERS (if applicable) to a nominal level (this is usually between "noon" and "3:00" on a rotary knob).
3. Play the source.
4. Turn up the βVERB's INPUT level until you see the Digital Saturation LED start lighting on peaks; then reduce it slightly until the LED stops lighting. The ideal input level, to minimize the noise, is just below the Clipping level. But if other instruments will be added to the mix later, or levels are unpredictable (as in a live Show), it's preferable to leave additional headroom by turning the input level down a bit more.
5. Depending on the input sensitivity of the mixer's channels or Aux Returns, the OUTPUT knob of the βVERB should be set somewhere between "2:00" and fully clockwise ("5:00").
6. Turn up the AUX RETURN level until the desired level of effect in the mix is reached. The control in the chain that may need to be set to a low level is the Aux Return on the mixer itself. Here is where should be increased or decreased the overall effect level in the mix to minimize the noise.

4.4 Operational Overview

Switching ON the βVERB, after an initialization procedure, the last stored preset will be loaded and will be lost all the NOT stored modifications to the last preset itself.

To load exactly the last preset's configuration running before the switching OFF of the βVERB, it's necessary to store these modifications using the STORE Function available in UTILITY Menu.

After the initialization procedure, on the LCD will appear the first field of the UTILITY Menu and the LED related to the UTILITY Button will turn ON.

Utility Button(13): To access the UTILITY Menu it's necessary to push the UTILITY Button (13).
If the βVERB is already working on Utility Menu (Utility LED (4) = ON) each further use of the button will have no effect.
Using the Utility Menu is possible to access the following functions:

Load Preset: this function allows the loading of one of the 128 available presets, where the first 64 presets (1, 64), are factory presets, and the presets from 65 to 128 are the User's configurable presets and all not initialized (Empty) at βVERB selling time.
To Load a preset:
- Select "Load Preset" using **UP/DOWN** buttons
- Press **ENTER** button to access the further sub menu
- Select the chosen preset using **UP/DOWN** buttons
- Press **ENTER** to load the preset or press **ESC** button if you decide to not load anymore the preset

Once terminated the sequence above, on the display will appear the name of the selected preset and the system will go back to the starting menu.

Store Preset: this function allows the storing on one of the 64 available memory locations the modified (using the Editing Menu) user's preset, starting from one of the 64 available factory presets.
To Store a preset:
- Select "Store Preset" using **UP/DOWN** buttons
- Press **ENTER** button to access the further sub menu
- Select the memory location (Empty or already occupied from a previous user's preset) where to store the new user's preset using **UP/DOWN** buttons
- If you want to give up, press **ESC** to go back to the main menu without storing the new preset otherwise press **ENTER** to store the new preset. The user can choose the identification name for the new preset using 6 characters max.

The blinking character show the character will be modified using the **UP/DOWN** buttons. When the right character appears, press enter to confirm the character itself and pass to the next one. Pressing **ESC** before the 6thcharacter, the old name will be maintained as name of the new preset.
Pressing **ENTER** as confirmation of the 6th character, the new preset will be stored with the new name. There is no possibility to correct a confirmed character, if necessary to change again the name, repeat the storing process from the beginning.
Once terminated the sequence above, on the display the name of the new stored preset will appear and the system will go back to the starting menu.

MIDI Setup: the MIDI SETUP utility allows the user to set up the βVERB MIDI configuration. The configurable MIDI parameters are:
- **MIDI Channel**: allows to define the MIDI CHANNEL to associate to the βVERB when connected to Remote MIDI devices. When MIDI CHANNEL is set to OFF, the βVERB will ignore each midi command coming from the external midi devices.
- **MIDI Output:** when this function is set as ON it is possible to ECHO on the MIDI output of the βVERB all the incoming MIDI messages.

Effect: this function allows to avoid the DIRECT signal percentage (Effect = WET) of the running preset, setting the βVERB in a mode useful for the "Send/Return" use of the βVERB itself. When Effect =WET, the %Dir field, normally available when in preset's editing, will be no longer accessible to the user. If Effect = Dry, the %Dir field will be accessible to the user and will determine the percentage of direct signal mixed to the effected one. Effect is a system's parameter and its action will affect all the running presets.

Output Attenuation This control allows the digital output volume setting. This parameter is a "system parameter" and its modification acts on all the presets.

Digital Mix On/Off Button (14): The function activated and deactivated by this key, represents one of the most powerful features of βVERB.
βVERB offers the possibility to mix Dry and Wet signals digitally or analogically. When Digital Mix ON/OFF key is pressed and the related Digital Mix ON/OFF LED is on (red), βVERB is allowing the Dry/Wet digital mixing, where the Dry and Wet percentages are chosen by means of the "%dir" and "%eff", available within "EDIT MENU".

When Digital Mix ON/OFF is on, the analog mix potentiometer must be positioned on fully Wet. It is possible to save preset including digital direct sound. When recalled, if the Digital Mix ON/OFF function is on, the preset will have the previously chosen "%dir" and "%eff". If the Digital Mix ON/OFF is off, the recalled preset will have only the Wet full percentage.
All the factory presets do not have digital "%dir" sound, so to permit to use easily βVERB as Send/Return device.

Up/Down Button (8/9)**:** these buttons are used to move inside the menus and to modify the parameter's value.

Enter/Esc Button (10/11)**:** these buttons are used to access or to leave the several menus, or to confirm or not the parameter's value.

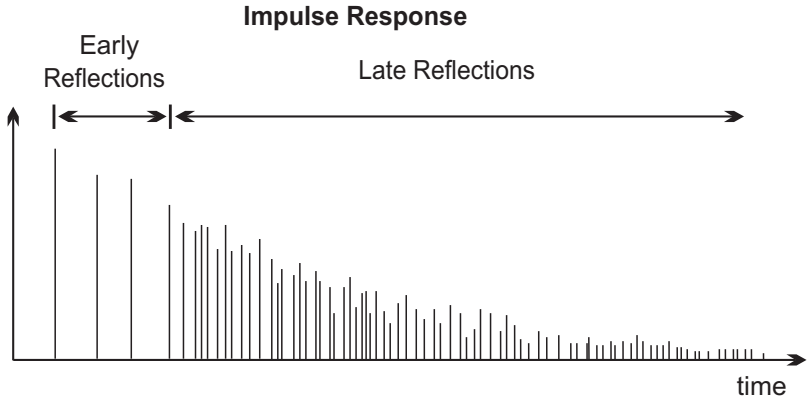
Edit Button (12)**: this button allows the user to enter the EDIT Menu (the Edit LED(3) will be ON).**
When entered the Edit Menu, the user will be able to access and modify all the parameters related to the effects. When the user will modify one parameter's value, the LED (1) will start to blink to signal the modification of the parameter. The LED will blink until the storing of the new modified preset in one of the 64 available locations.

PRESET NOT SAVED LED (1) this LED is blinking when a preset's parameter has been modified and the new preset's configuration has not yet stored in a memory location. If you do not want to store the modified preset accepting to lose the new configuration passing to a next preset or turning off the βVERB, you can proceed with the βVERB use also if that LED is ON.

5. ALGORITHMS DESCRIPTIONS

5.1 Reverbs

Reverb in nature, is the sum of a large number of distinct echoes generated by the reflection of the original sound against obstacles (i.e. walls). In a real acoustic space, the amplitude and brightness of these reflections decay over time and the decaying is depending on the room size, the position of the sound source acoustic space, the "nature" of obstacles (shape, material, dimension, etc.), and many other factors.



a. Halls
This algorithm is the simulation of a large acoustic space (as a concert hall). Halls want to simulate large rooms with many reflective surfaces, where sounds can be reflected and also hided, changing its "colour" over time. This is a classic reverb and can be used with all sound sources as vocals, drums or acoustic and electric instruments.

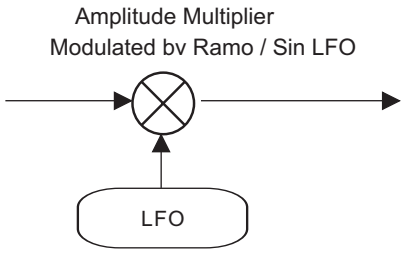
b. Rooms
This algorithm try to reproduce the sound of a medium size room. It has a more dense and rich sound than the hall reverb algorithm, and this quality makes it good for rock and "disco" music. The attack is well defined and "aggressive", sounding very good on keyboards, guitars and drums.

c. Plates
This algorithm want to simulate the "sound" of a classic plate reverb, obtained in the past using suspended sheet of metal with transducers at either end. This kind of reverb, commonly used in the 1970's, it is still useful for its transparent sound and it works well for vocals, piano, or guitar.

5.2 Modulations

a. Tremolo

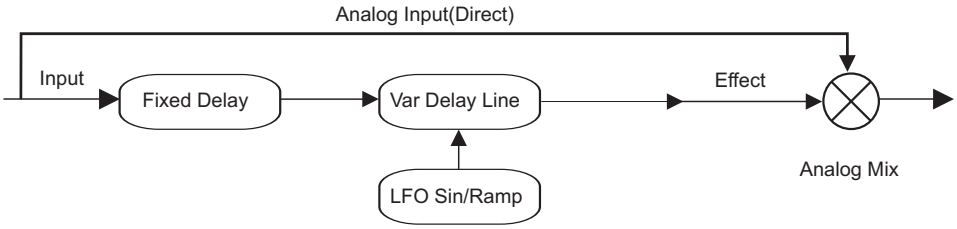
Tremolo is an amplitude modulation of the signal. It is useful for adding warmth and life to standing electric piano or guitar's chords.



Tremolo- This program provides an amplitude modulation of the input signal and is normally used as "WET" effect without adding direct sound or adding a few percentage of it, so to avoid the direct sound to cover the amplitude modulation.

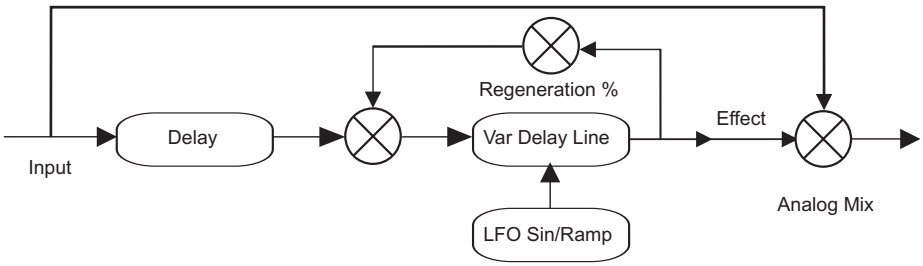
b. Chorus

The Chorus effect tries to recreate the illusion of more than one instrument from a single instrument sound. Two musicians playing the same instrument never play in perfect unison (both time and pitch wise). In order to build up the proper illusion using an electronic device, the original sound is summed with a slightly delayed and detuned version of itself. Instead of a constant pitch deviation, more natural results come from a varying pitch deviation (two players never keep constant their relative pitch distance). βVERB's algorithm implements the variable delay and the detuning of it is modulated by an LFO (low frequency oscillator) which causes the detuning to vary. The direct sound and the detuned one are summed analogically on the outputs.



c. Flanger

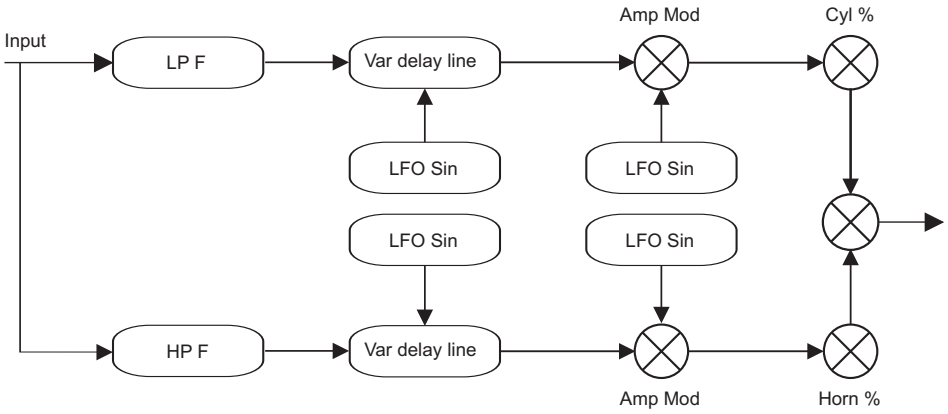
The flanger started its life as a mechanical realization: two identical tapes were run in parallel while a human operator randomly controlled the speed of each unit, making minor variations up and down the nominal tape speed. Mixing the sound from both tapes, the signals sometimes aligned in phase, while other times aligned in counter phase, resulting in a time-varying filtering that has been named 'flanger'. The structure of the flanger is then that of the mix of two randomly delayed copies of a signal. Here the detuning process is same as the one of the chorus, added with a "regeneration" part.



d. Rotary (Speakers)

The rotary speaker effect simulates the sound effect achieved by rotating horn speakers and a bass cylinder, as first produced for organs. The sound is altered by the Doppler effect, the directional characteristic of the speakers, phase effects due to air turbulence, etc. The rotary speaker system is normally used with organs, but can be used also for guitar amplification.

Note: When using the Rotary program, the Mix potentiometer has be turned all right on "WET" position This control sets the amplitude modulation rate.



5.3 Delay

Delay effect is a single echo repetition where the repetitions occur after a certain "delay time" and where the number of repetitions depend on a "decay time" time, defining the time necessary to decrease the amplitude of the repetition from the original sound level to zero.

Delay- This program provides a delay of up to 1000 ms. The delay time can be adjusted in terms of delay and the decay time depends automatically from the delay time. This is a useful utility program which can add space to vocals kor instruments.

5.4 Effects Functional Data

Effect Algorithms	Reverb, Reverse, Stereo Delay, PingPong Delay, Multi Delay, Chorus, Flanger, Tremolo, Leslie
Reverb	Switchable input low pass filter 1 kHz/16 kHz step 1/3 oct. Switchable high damp 1 kHz/16 kHz step 1/3 oct. Switchable low damp 50 Hz/1 kHz step 1/3 oct. Reverb pre-delay 0/254 ms step 2 ms. Early reflections pre-delay 0/254 ms step 2 ms. Fast reflections pre-delay 0/254 ms step 2 ms. Diffusion: min-max in 127 steps. Density: min-max in 127 steps. Decay: min-max in 127 steps.Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct. Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct. Tuning: min/max in 127 steps. Percentage of early reflections: min-max in 127 steps. Percentage of fast reflections: min-max in 127 steps. Percentage of reverb: min-max in 127 steps. Percentage of effect : min-max in 100 steps. Percentage of direct signal: min-max in 127 steps.
Reverse	Time 40/705 ms in 200 steps Pre-delay 0/254 ms step 2 ms. Density: min-max in 127 steps. Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct. Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct. Reverse Mode: Linear/Exponential/Gated. Percentage of effect : min-max in 127 steps. Percentage of direct signal: min-max in 127 steps.
Stereo Delay	Switchable input low pass filter 1 kHz/16 kHz step 1/3 oct. Switchable high damp 1 kHz/16 kHz step 1/3 oct. Switchable low damp 50 Hz/1 kHz step 1/3 oct. Time Left: 0/995 ms step 5 ms.

Time Right: 0/995 ms step 5 ms.
Decay Left: min-max in 127 steps.Decay Right: min-max in 127 steps.Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct.
Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct.
Link L+R: on/off.
Percentage of effect : min-max in 127 steps.
Percentage of direct signal: min-max in 127 steps.

Ping Pong Delay

Switchable input low pass filter 1 kHz/16 kHz step 1/3 oct.
Switchable high damp 1 kHz/16 kHz step 1/3 oct.
Switchable low damp 50 Hz/1 kHz step 1/3 oct.
Time: 0/995 ms step 5 ms.
Decay: min-max in 127 steps.Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct.
Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct.
Percentage of effect : min-max in 127 steps.
Percentage of direct signal: min-max in 127 steps.

Multi Delay

Switchable input low pass filter 1 kHz/16 kHz step 1/3 oct.
Switchable high damp 1 kHz/16 kHz step 1/3 oct.
Switchable low damp 50 Hz/1 kHz step 1/3 oct.
Time 1: 0/995 ms step 5 ms.
Time 2: 0/995 ms step 5 ms.
Time 3: 0/995 ms step 5 ms.
Decay 1: min-max in 127 steps.
Decay 2: min-max in 127 steps.
Decay 3: min-max in 127 steps.
Volume 1: min-max in 127 steps
Volume 2: min-max in 127 steps
Volume 3: min-max in 127 steps
Pan-pot 1: min-max in 127 steps
Pan-pot 2: min-max in 127 steps
Pan-pot 3: min-max in 127 steps
Percentage of effect : min-max in 127 steps.
Percentage of direct signal: min-max in 127 steps.

Chorus

Switchable high damp 1 kHz/16 kHz step 1/3 oct.
Switchable low damp 50 Hz/1 kHz step 1/3 oct.
Rate Left: min-max in 128 steps.
Rate Right: min-max in 128 steps.
Depth Left: min-max in 240 steps.
Depth Right: min-max in 240 steps.
Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct.
Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct.
Phase Effect: Direct/Reverse.
Oscillator Type: Sine/Ramp.
Effect Mode: Stereo/Mono/Sum.
Percentage of effect : min-max in 127 steps.
Percentage of direct signal: min-max in 127 steps.

Flanger	Switchable high damp 1 kHz/16 kHz step 1/3 oct. Switchable low damp 50 Hz/1 kHz step 1/3 oct. Rate Left: min-max in 128 steps. Rate Right: min-max in 128 steps. Depth Left: min-max in 240 steps. Depth Right: min-max in 240 steps. Decay Left: min-max in 127 steps. Decay Right: min-max in 127 steps. Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct. Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct. Phase Effect: Direct/Reverse. Oscillator Type: Sine/Ramp. Effect Mode: Stereo/Mono/Sum. Percentage of effect : min-max in 127 steps. Percentage of direct signal: min-max in 127 steps.
Tremolo	Switchable high damp 1 kHz/16 kHz step 1/3 oct. Switchable low damp 50 Hz/1 kHz step 1/3 oct. Rate Left: min-max in 128 steps. Rate Right: min-max in 128 steps. Depth Left: min-max in 240 steps. Depth Right: min-max in 240 steps. Switchable effect high pass filter 50Hz/1 kHz step 1/3 oct. Switchable effect low pass filter 1 kHz/16 kHz step 1/3 oct. Phase Effect: Direct/Reverse. Oscillator Type: Sine/Ramp. Effect Mode: Stereo/Mono/Sum. Percentage of effect : min-max in 127 steps. Percentage of direct signal: min-max in 127 steps.
Leslie	Switchable low pass cyl: 50Hz/16kHz step 1/3 oct. Switchable high pass horn: 50Hz/16kHz step 1/3 oct. Rate cyl.: min-max in 128 steps. Rate horn: min-max in 128 steps. Depth cyl.: min-max in 240 steps. Depth horn: min-max in 240 steps. Cyl. amplitude modulation: min-max in 127 steps. Horn amplitude modulation: min-max in 127 steps. Cyl. volume: min-max in 127 steps. Horn volume: min-max in 127 steps. Percentage of effect : min-max in 100 steps. Percentage of direct signal: min-max in 127 steps.
Effect Mix	Dry (%direct signal=X), Wet (%direct signal=0).
Output digital Attenuation	mute - 0dB in 127 steps.

5.5 Factory Presets Program Chart

ROOM-REVERB

	Room 1	***Room 2***	***Room 3***	***Room 4***	***Room 5***	***Room 6***	***Room 7***	***Room 8***
Low Pass [Hz]	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass
H Damp [Hz]	12500	2500	12500	12500	12500	12500	12500	2500
L Damp [Hz]	50	50	50	50	50	50	50	50
PreDly Rev [ms]	4	18	4	4	4	4	4	18
PreDly ER [ms]	20	8	22	20	20	4	4	8
PreDly FR [ms]	58	78	58	58	58	58	58	78
Diffusion	127	127	127	127	127	127	127	127
Density	58	58	58	58	58	58	58	58
Decay	17	107	65	94	104	53	80	80
HP Eff [Hz]	50	200	50	50	50	50	50	200
LP Eff [Hz]	12500	5000	12500	12500	12500	12500	12500	5000
Tuning	35	24	33	20	24	39	21	21
% Vol ER	71	39	71	70	72	31	31	39
% Vol FR	119	105	119	119	118	78	78	95
% Vol Rev	127	127	127	127	127	127	127	127
% Vol Eff	100	100	100	100	100	100	100	100
% Vol Dir	127	127	127	127	127	127	127	127

HALL-REVERB

	Hall 1	***Hall 2***	***Hall 3***	***Hall 4***	***Hall 5***	***Hall 6***	***Hall 7***	***Hall 8***
Low Pass [Hz]	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass
H Damp [Hz]	2500	12500	12500	12500	12500	12500	8000	8000
L Damp [Hz]	50	50	50	50	50	50	50	50
PreDly Rev [ms]	72	50	0	0	0	50	72	72
PreDly ER [ms]	154	156	156	154	156	156	156	156
PreDly FR [ms]	0	0	0	0	0	0	0	0
Diffusion	127	127	127	127	127	127	127	127
Density	0	75	9	9	9	75	0	0
Decay	87	16	99	103	93	116	53	113
HP Eff [Hz]	50	50	50	50	50	50	50	50
LP Eff [Hz]	4000	16000	12500	12500	12500	16000	4000	4000
Tuning	30	32	34	31	31	28	31	32
% Vol ER	15	30	0	0	0	28	8	8
% Vol FR	12	61	0	0	0	63	5	5
% Vol Rev	127	127	127	127	127	127	127	127
% Vol Eff	100	100	100	100	100	100	100	100
% Vol Dir	127	127	127	127	127	127	127	127

PLATE-REVERB

	Plate 1	***Plate 2***	***Plate 3***	***Plate 4***	***Plate 5***	***Plate 6***	***Plate 7***	***Plate 8***
Low Pass [Hz]	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass	Bypass
H Damp [Hz]	12500	5000	5000	12500	12500	5000	12500	12500
L Damp [Hz]	200	50	100	100	100	50	200	200
PreDly Rev [ms]	30	18	18	18	18	18	32	32
PreDly ER [ms]	4	8	8	8	8	8	4	4
PreDly FR [ms]	38	92	90	110	110	90	40	40
Diffusion	127	127	127	127	127	127	127	127
Density	41	41	41	41	41	41	41	41
Decay	16	65	111	53	94	80	80	80
HP Eff [Hz]	200	200	200	200	200	200	200	200
LP Eff [Hz]	16000	6300	6300	16000	16000	6300	16000	16000
Tuning	42	28	60	12	27	31	29	31
% Vol ER	26	26	16	18	27	26	20	18
% Vol FR	66	68	62	61	63	63	62	65
% Vol Rev	127	127	127	127	127	127	127	127
% Vol Eff	100	100	100	100	100	100	100	100
% Vol Dir	127	127	127	127	127	127	127	127

REVERSE

	Short G	***Long G***	***Short R***	***Long R***
Time [ms]	75	267	75	267
PreDelay [ms]	0	0	0	0
Density	127	127	127	127
HP Eff [Hz]	100	100	100	100
LP Eff [Hz]	6300	6300	6300	6300
Reverse Mode	Gated	Gated	Linear	Gated
% Vol Eff	127	127	127	127
% Vol Dir	58	58	127	58

STEREO DELAY

	100 ms	***300 ms***	***400 ms***	***M 100***	***M 200***	***M 400***
Low Pass [Hz]	10000	10000	10000	10000	10000	10000
H Damp [Hz]	6300	6300	6300	6300	6300	6300
L Damp [Hz]	80	80	80	80	80	80
Time R [ms]	100	300	400	100	200	400
Time L [ms]	200	200	600	100	200	400
Decay L	56	56	60	30	45	60
Decay R	54	54	50	30	45	60
HP Eff [Hz]	80	80	80	80	80	80
LP Eff [Hz]	8000	8000	8000	8000	8000	8000
Link L+R	OFF	OFF	OFF	OFF	OFF	OFF
% Vol Eff	127	127	127	127	127	127
% Vol Dir	127	127	127	127	127	127

PING-PONG DELAY

	100 ms	***200 ms***	***300 ms***	***400 ms***
Low Pass [Hz]	8000	8000	8000	8000
H Damp [Hz]	6300	6300	6300	6300
L Damp [Hz]	63	63	63	63
Time [ms]	100	200	300	400
Decay	50	50	50	50
HP Eff [Hz]	80	80	80	80
LP Eff [Hz]	5000	5000	5000	5000
% Vol Eff	127	127	127	127
% Vol Dir	127	127	127	127

MULTI DELAY

	150 ms	***300Ams***	***300Bms***	***375 ms***
Low Pass [Hz]	8000	8000	8000	8000
H Damp [Hz]	6300	6300	6300	6300
L Damp [Hz]	100	100	100	100
Time1 [ms]	150	300	300	375
Time2 [ms]	300	400	600	300
Time3 [ms]	75	150	300	75
Decay 1	59	59	47	59
Decay 2	65	65	65	65
Decay 3	66	66	73	66
Volume 1	119	112	127	112
Volume 2	127	127	125	127
Volume 3	111	109	95	109
PanPot 1	L=0 R=127	L=0 R=127	L=0 R=127	L=0 R=127
PanPot 2	L=64 R=63	L=64 R=63	L=64 R=63	L=64 R=63
PanPot 3	L=127 R=0	L=127 R=0	L=127 R=0	L=127 R=0
% Vol Eff	127	127	127	127
% Vol Dir	127	127	127	127

CHORUS

	Sin 1	***Sin 2***	***Sin 3***	***Sin 4***	***Ramp 1***	***Ramp 2***	***Ramp 3***	***Ramp 4***
H Damp [Hz]	8000	8000	8000	8000	8000	8000	8000	8000
L Damp [Hz]	80	80	80	80	80	80	80	80
Rate L	9	24	9	20	10	10	29	45
Rate R	12	18	12	25	11	11	23	64
Depth L	102	43	163	89	135	217	135	43
Depth R	84	59	138	69	130	189	130	59
HP Eff [Hz]	80	80	80	80	80	80	80	80
LP Eff [Hz]	6300	6300	6300	6300	6300	6300	6300	6300
Phase Eff	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct
Type Osc	Sin	Sin	Sin	Sin	Sin	Sin	Sin	Sin
Mode Eff	Stereo	Stereo	Stereo	Stereo	Stereo	Stereo	Stereo	Stereo
% Vol Eff	127	127	127	127	127	127	127	127
% Vol Dir	127	127	127	127	127	127	127	127

FLANGER

	Sin 1	***Sin 2***	***Sin 3***	***Ramp 1***	***Ramp 2***	***Ramp 3***
H Damp [Hz]	12500	12500	12500	12500	12500	12500
L Damp [Hz]	80	80	80	80	80	80
Rate L	3	7	116	12	56	99
Rate R	2	12	116	11	41	101
Depth L	171	59	26	59	33	28
Depth R	194	56	36	102	49	31
Decay L	96	72	43	99	77	76
Decay R	88	57	31	96	91	88
HP Eff [Hz]	80	80	80	80	80	80
LP Eff [Hz]	10000	10000	10000	10000	10000	10000
Phase Eff	Inverse	Inverse	Inverse	Inverse	Inverse	Inverse
Type Osc	Sin	Sin	Sin	Sin	Sin	Sin
Mode Eff	Stereo	Stereo	Stereo	Stereo	Stereo	Stereo
% Vol Eff	127	127	127	127	127	127
% Vol Dir	127	127	127	127	127	127

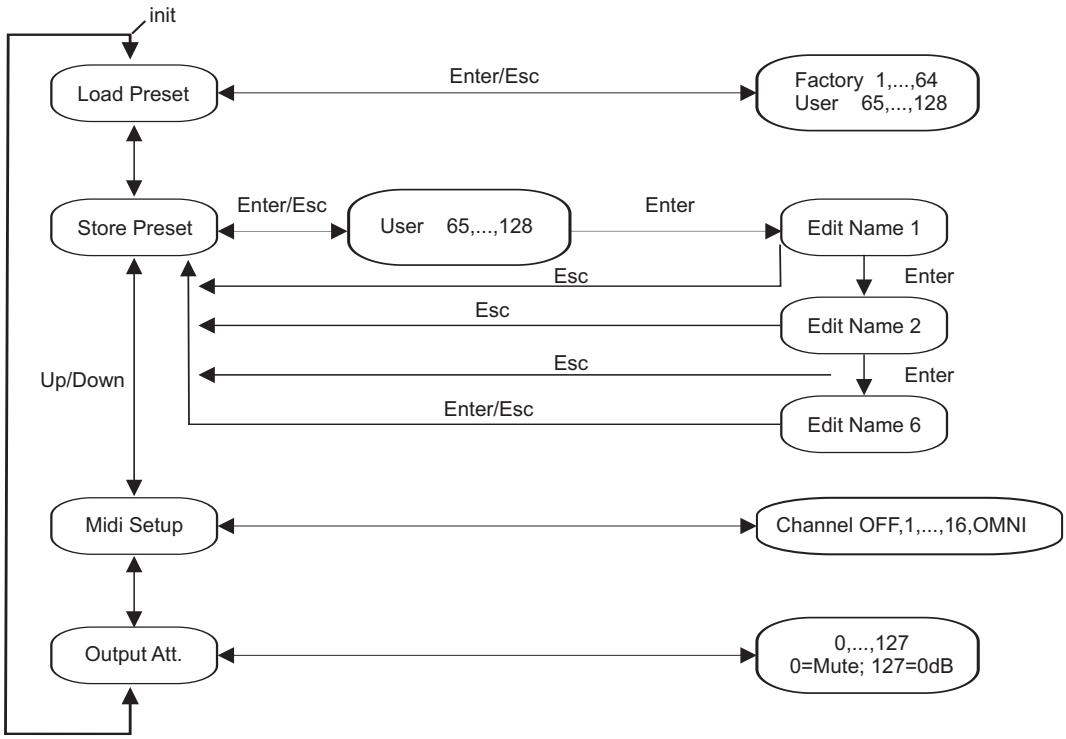
TREMOLO

	Sin 1	***Sin 2***	***Ramp 1***	***Ramp 2***
H Damp [Hz]	5000	10000	5000	10000
L Damp [Hz]	160	160	160	160
Rate L	10	76	56	93
Rate R	19	19	23	23
Depth L	112	112	199	135
Depth R	240	240	240	240
HP Eff [Hz]	100	100	100	100
LP Eff [Hz]	8000	10000	8000	10000
Phase Eff	Inverse	Inverse	Inverse	Inverse
Type Osc	Sin	Sin	Sin	Sin
Mode Eff	Mono	Mono	Mono	Mono
% Vol Eff	127	127	127	127
% Vol Dir	127	127	127	127

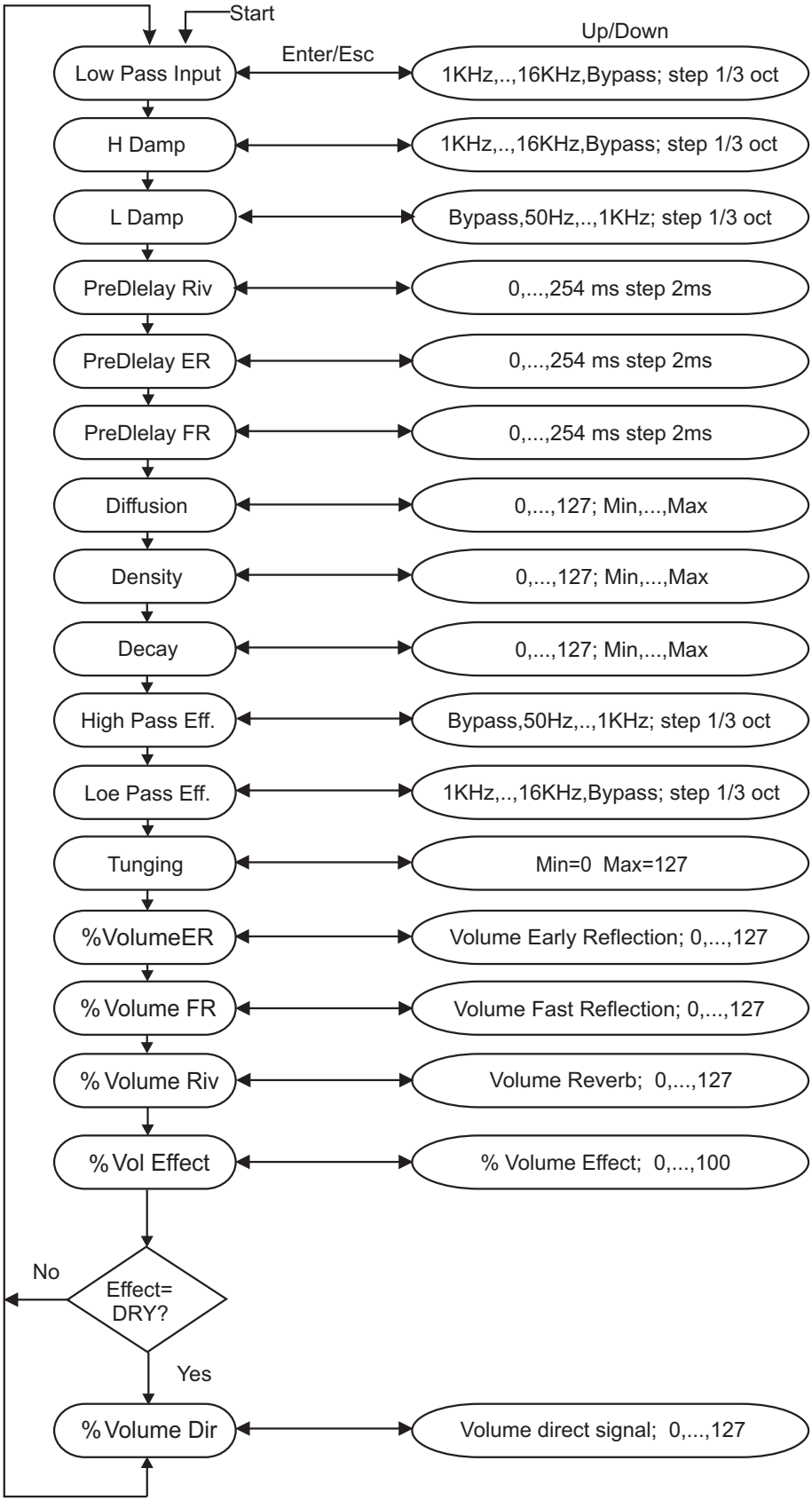
LESLIE

	Slow 1	*Slow 2*	*Fast 1*	*Fast 2*
LP Cyl [Hz]	2000	2000	2000	2000
HP Horn [Hz]	1600	1600	1600	1600
Rate Cyl	5	5	60	60
Rate Horn	12	12	65	64
Depth Cyl	105	143	105	143
Depth Horn	39	110	39	110
M Amp Cyl	8	20	8	20
M Amp Horn	13	45	13	45
Vol Cyl	127	127	127	127
Vol Horn	111	110	107	111
% Vol Eff	100	100	100	100
% Vol Dir	0	0	0	0

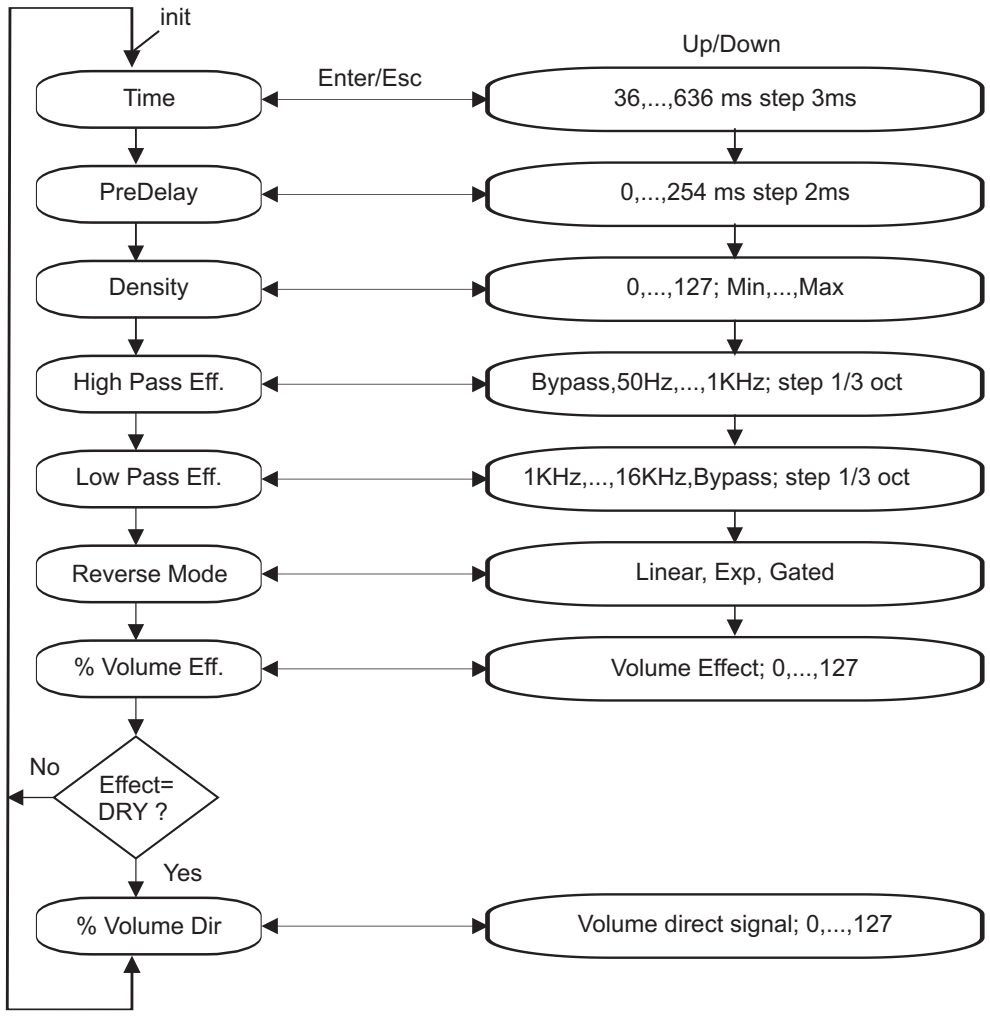
UTILITY MENU



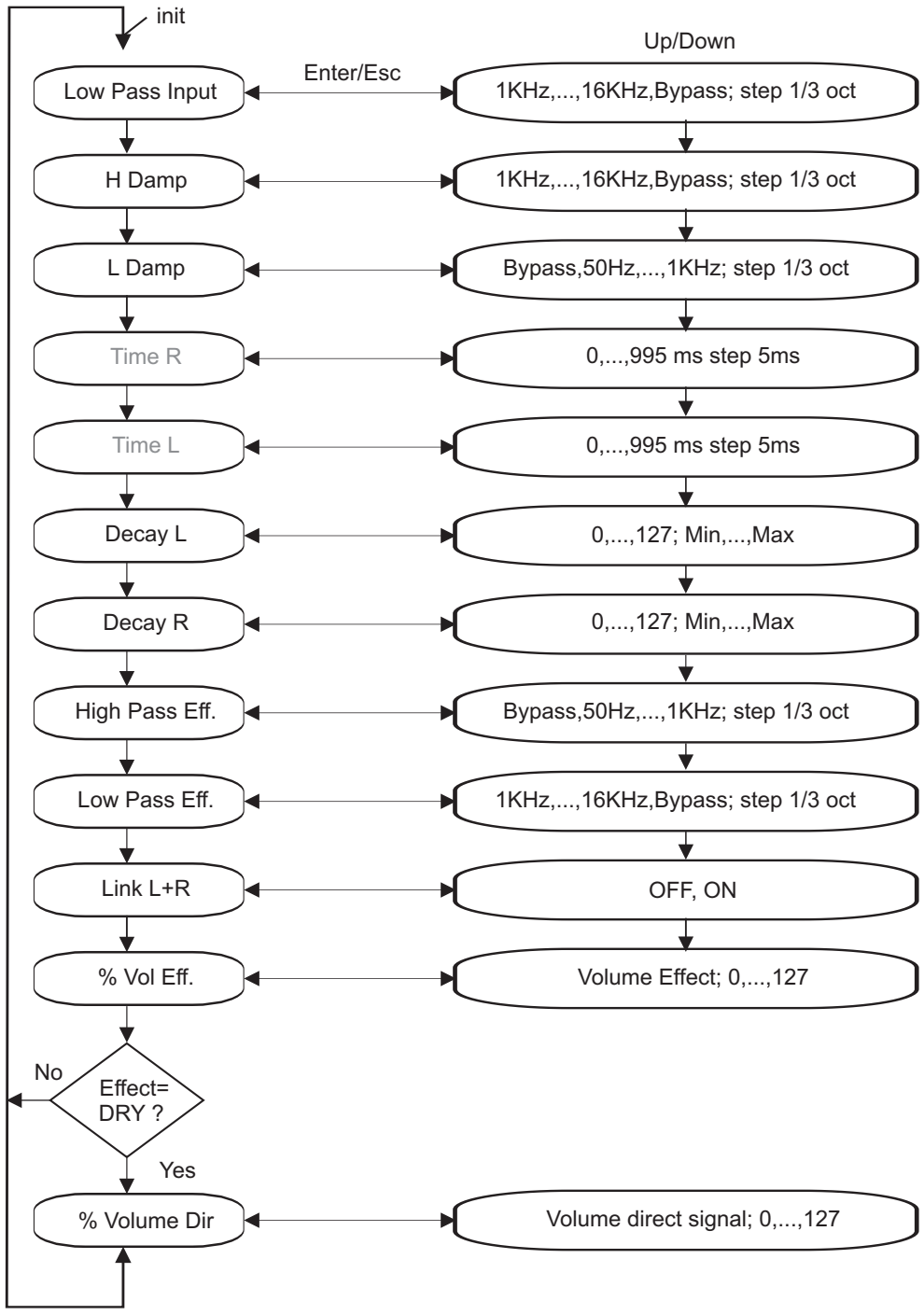
Reverb Effect - EDIT MENU



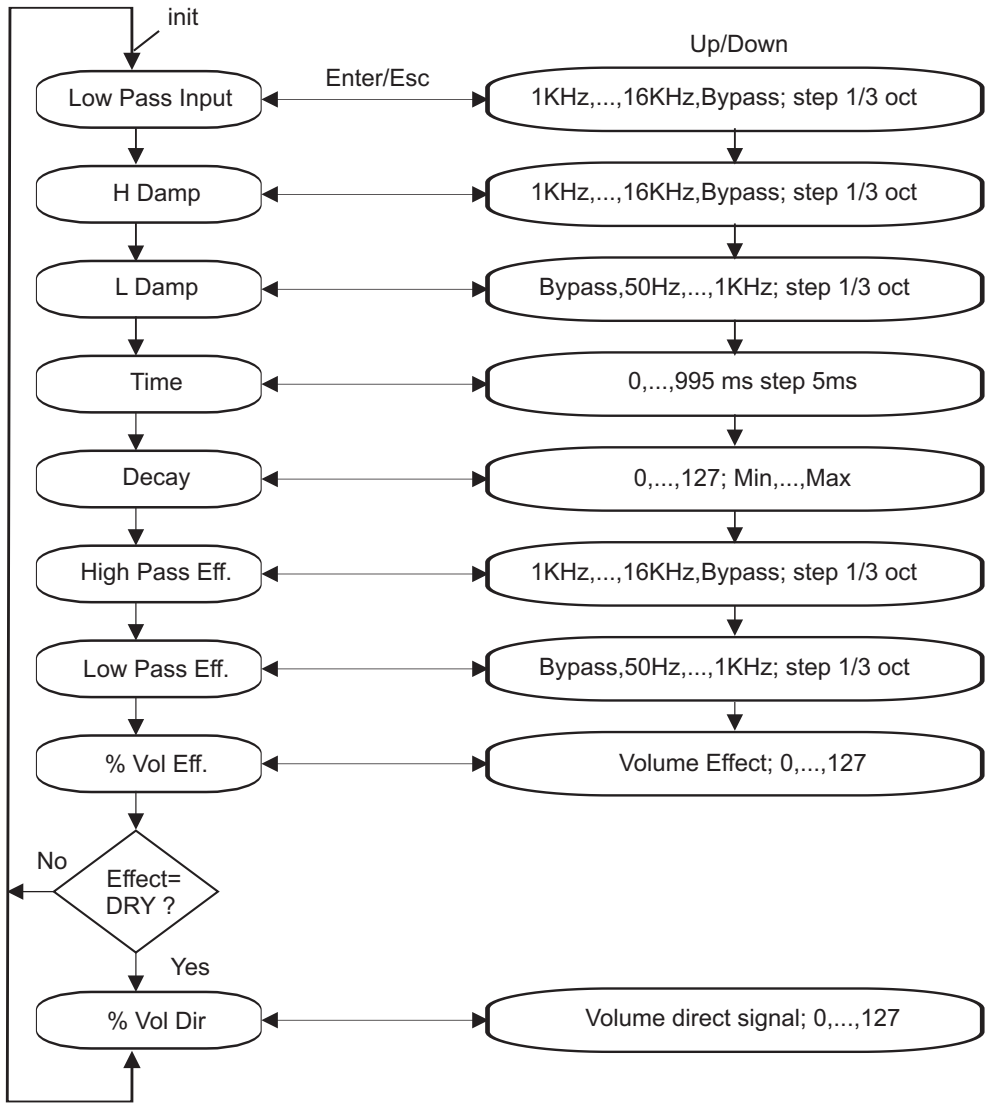
Reverse Effect - EDIT MENU



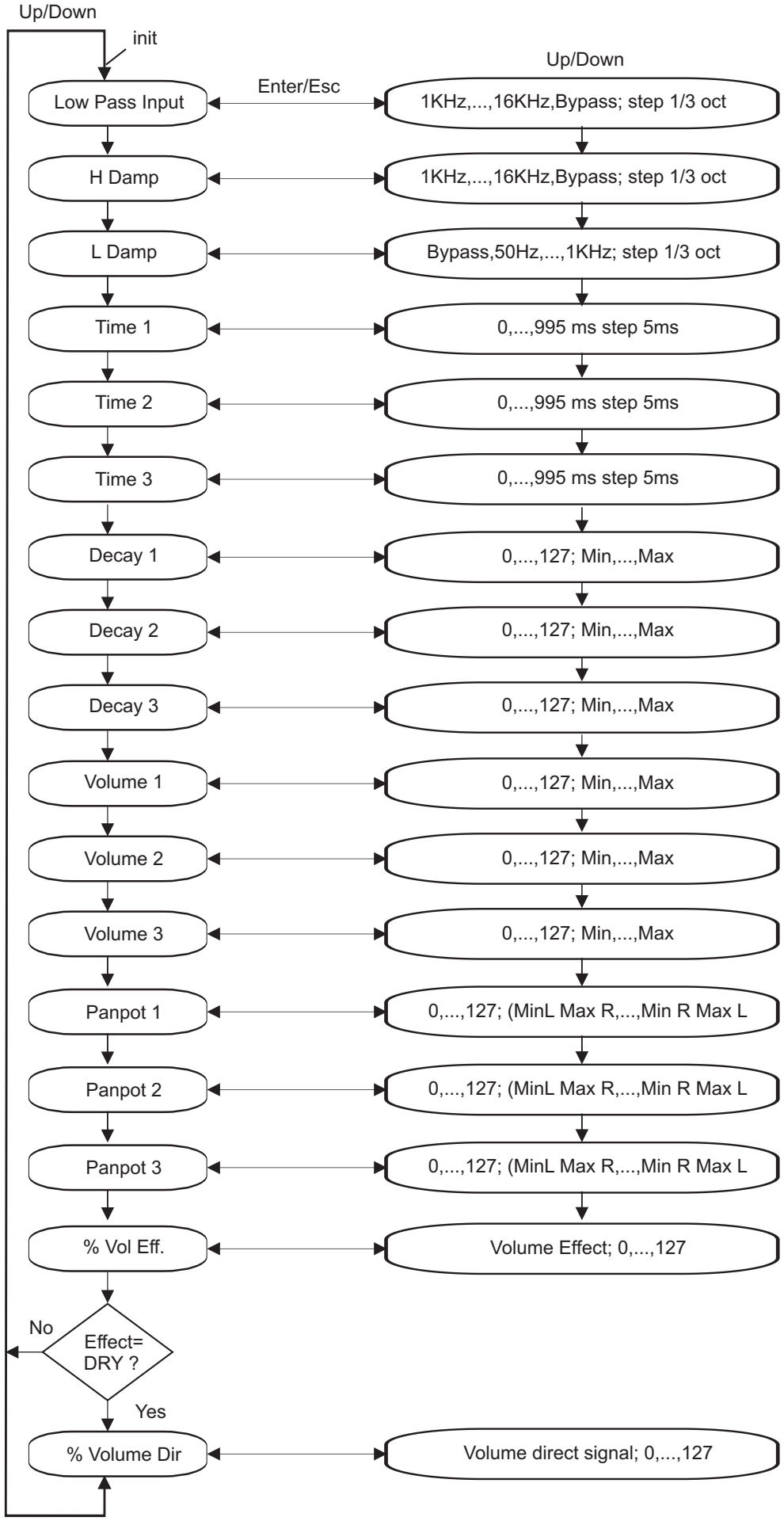
Stereo Delay Effect - EDIT MENU



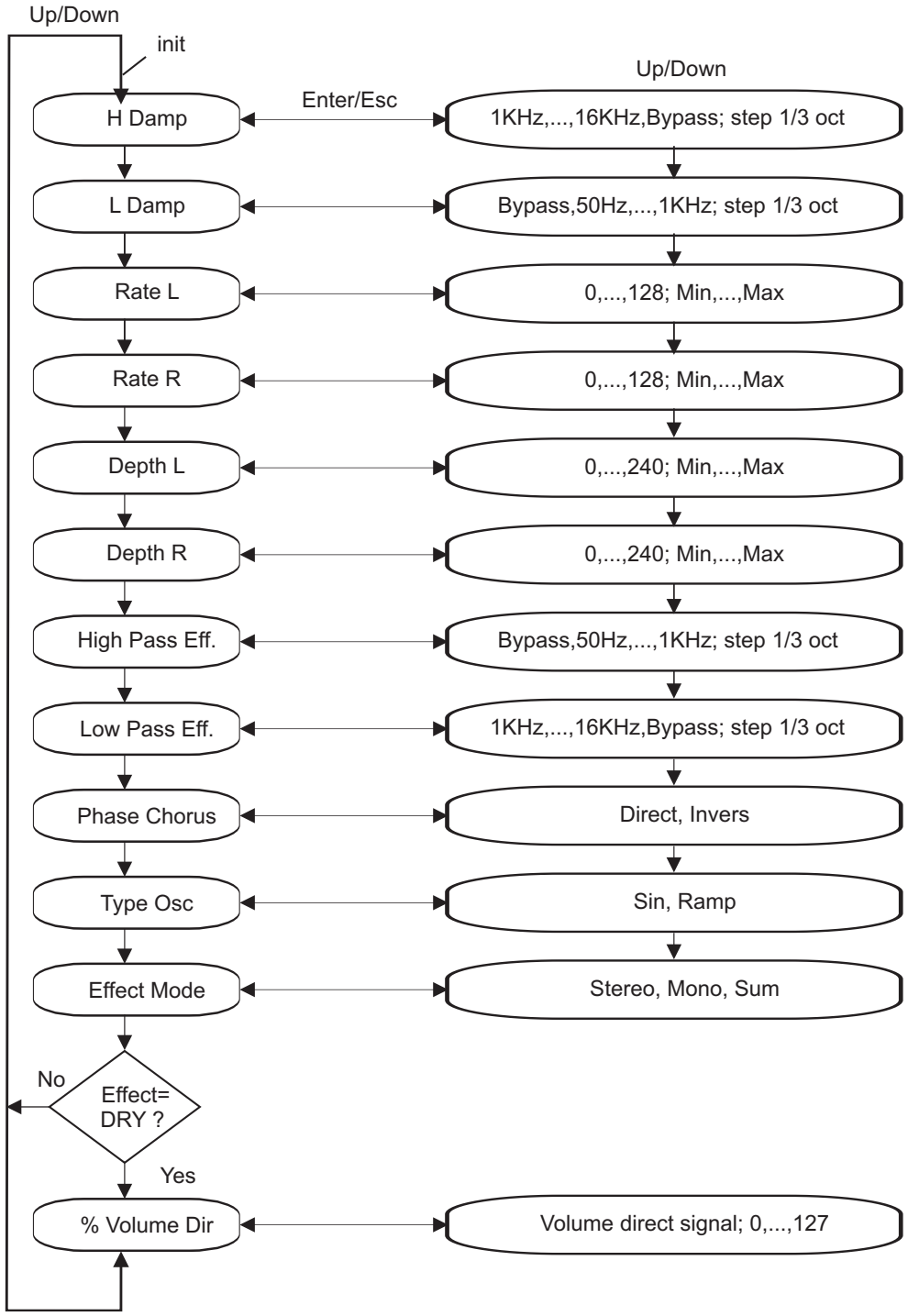
PingPong Delay Effect - EDIT MENU



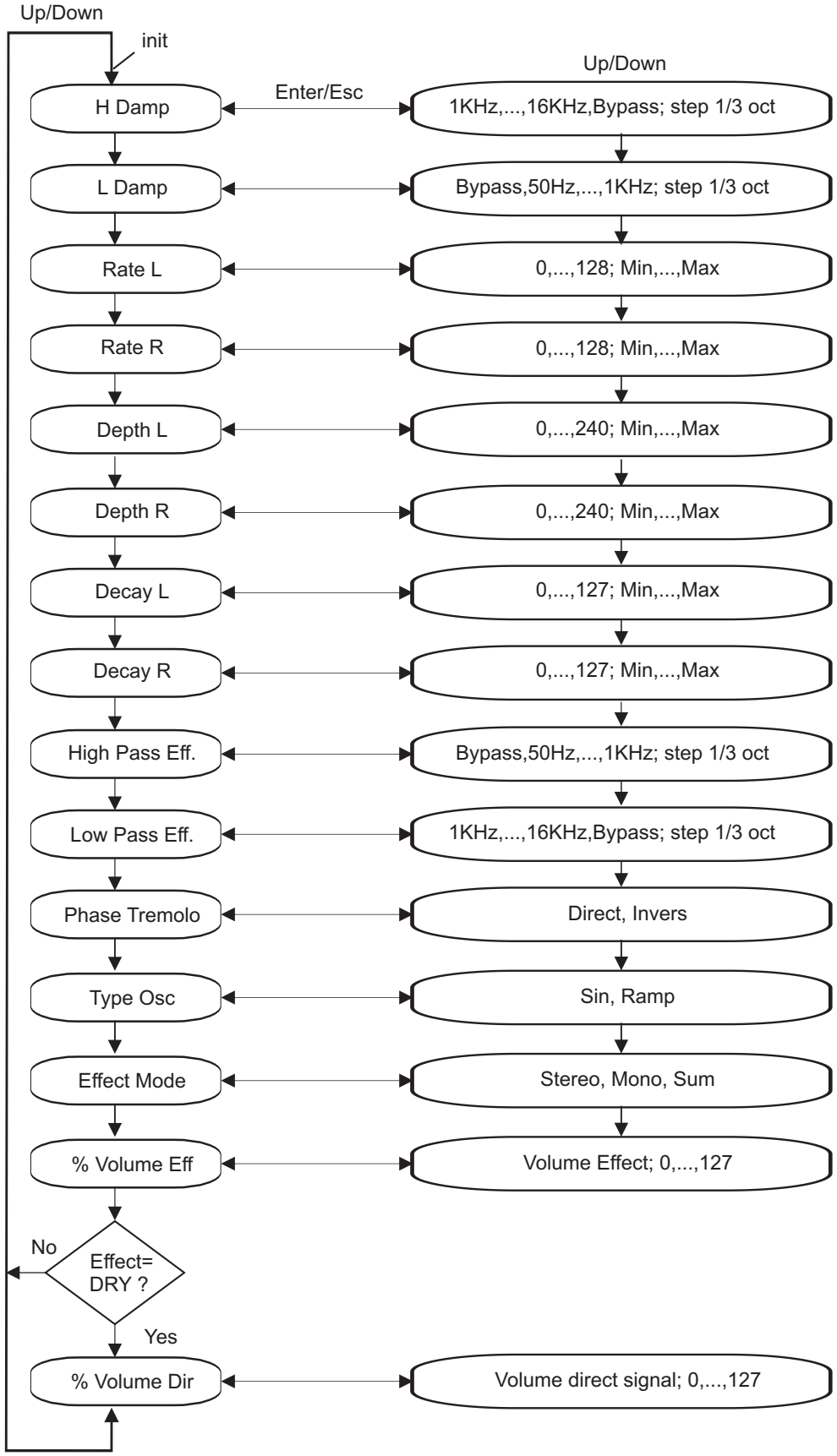
Multi Delay Effect - EDIT MENU



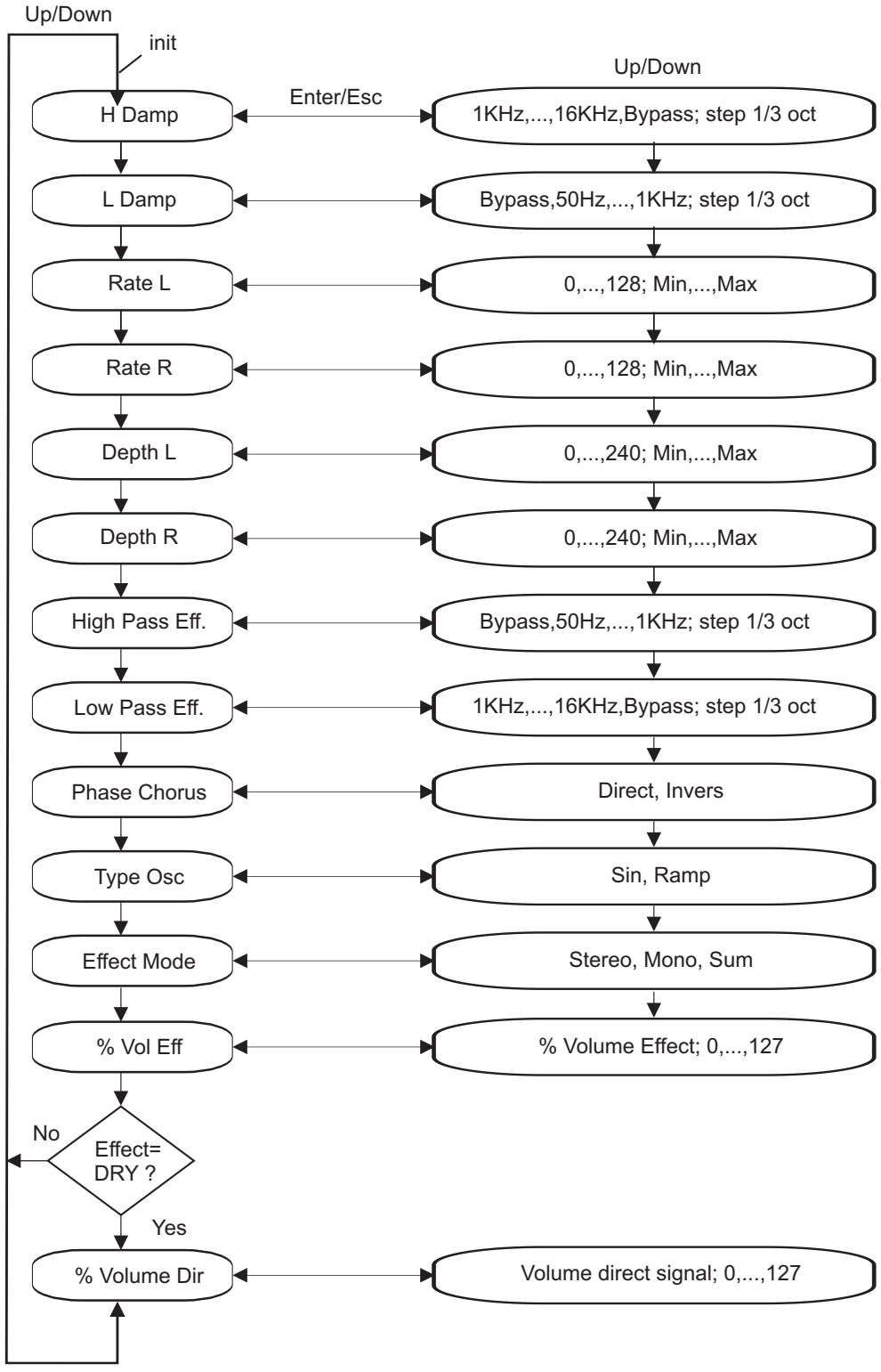
Chorus Effect - EDIT MENU



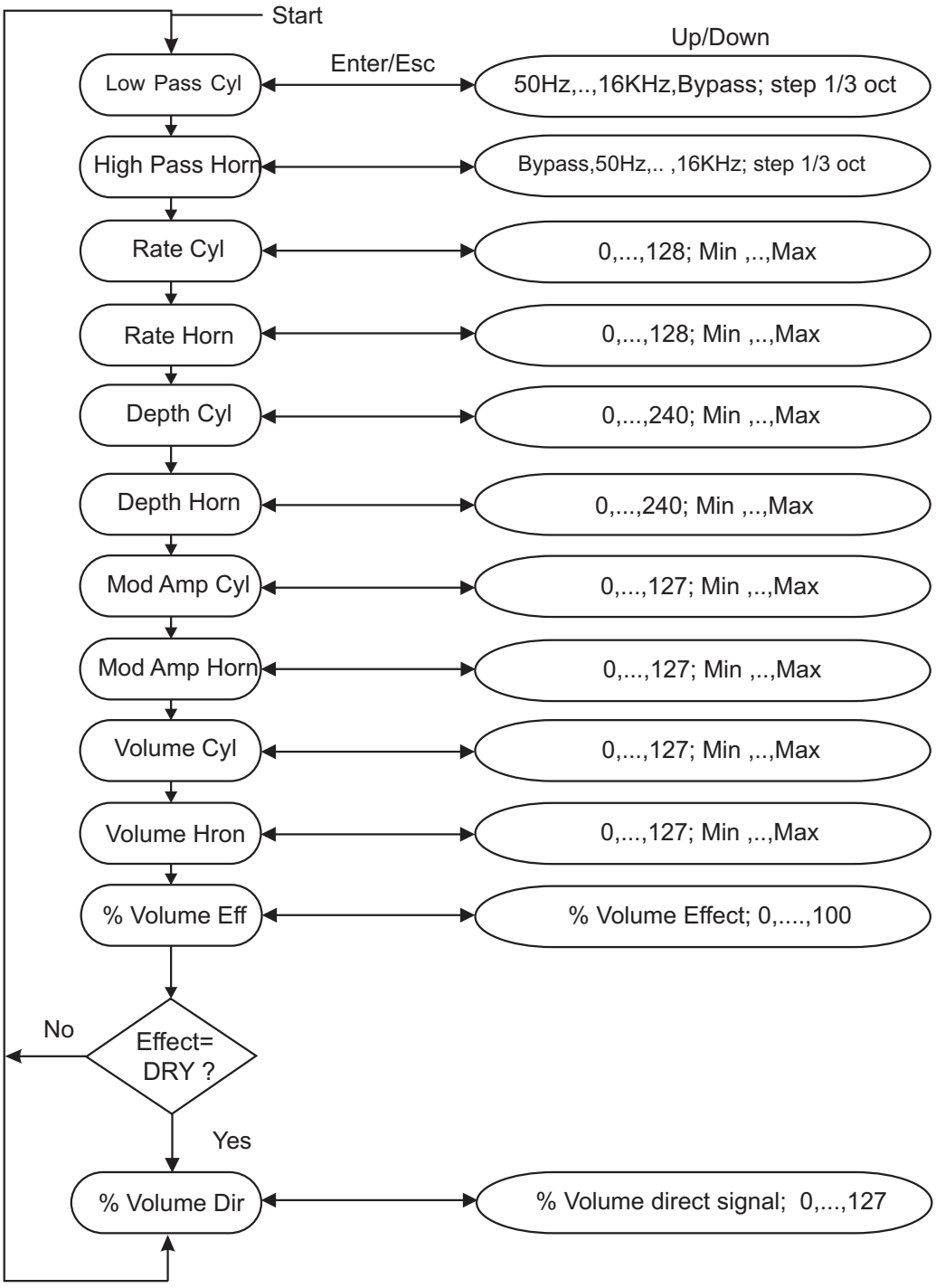
Flange Effect - EDIT MENU



Tremolo Effect - EDIT MENU



Leslie Effect - EDIT MENU



Effect & Parameter

	Reverb	Revers	St_Dly	Pp_Dly	Mt_Dly	Chorus	Flanger	Tremolo	Leslie
0	Low Pass Input	Time	Low Pass Input	Low Pass Input	Low Pass Input	H-Damp	H-Damp	H-Damp	Low Pass Cyl
1	H-Damp	PreDelay	H-Damp	H-Damp	H-Damp	L-Damp	L-Damp	L-Damp	High Pass Horn
2	L-Damp	Density	L-Damp	L-Damp	L-Damp	Rate L	Rate L	Rate L	Rate Cyl
3	PreDelay E.R.	High Pass eff	Time L	Time	Time1	Rate R	Rate R	Rate R	Rate Horn
4	PreDelay P.R.	Low Pass eff	Time R	Decay	Time 2	Depth L	Depth L	Depth L	Depth Cyl
5	PreDelay Rev	Revers Mode	Decay L	High Pass eff	Time3	Depth R	Depth R	Depth R	Depth Horn
6	Diffusion	% Vol Eff	Decay R	Low Pass eff	Decay 1	High Pass eff	Delay L	High Pass eff	Mod Amp Cyl
7	Density	% Vol Dir	High Pass eff	% Vol Eff	Decay 2	Low Pass eff	Delay R	Delay R	Mod Amp Horn
8	Decay		Low Pass eff	% Vol Dir	Decay 3	Phase eff	High Pass eff	Phase eff	Vol Cyl
9	High Pass eff		Link L+R		Volume 1	Type Osc	Low Pass eff	Type Osc	Vol Horn
10	Low Pass eff		% Vol Eff		Volume 2	Mode Eff	Phase eff	Mode eff	% Vol Eff
11	Turning		% Vol Dir		Volume 3	% Vol Eff	Type Osc	% Vol Eff	% Vol Dir
12	% Vol E.R				PanPot 1	% Vol Dir	Mode eff	% Vol Dir	
13	% Vol F.R				PanPot 2		% Vol Eff		
14	% Vol Rev				PanPot 3		% Vol Dir		
15	% Vol Eff				% Vol Eff				
16	% Vol Dir				% Vol Dir				

MIDI

Change Preset

MIDI 1st Byte - PROGRAM CHANGE
MIDI 2nd Byte - 0,...,127

MIDI 2nd byte	Preset	Legend
0,...,7	Reverb - Room	Preset Custom Effect 1
8,...,15	Reverb - Hall	Preset Custom Effect 1
16,...,23	Reverb - Plate	Preset Custom Effect 1
24,...,27	Reverse	Preset Custom Effect 2
28,..,33	Stereo Delay	Preset Custom Effect 3
34,...,37	Pingpong Delay	Preset Custom Effect 4
38,...,41	Multi Delay	Preset Custom Effect 5
42,...,49	Chorus	Preset Custom Effect 6
50,...,55	Flanger	Preset Custom Effect 7
56,...,59	Tremolo	Preset Custom Effect 8
60,...,63	Leslie	Preset Custom Effect 9
64,...,127	User	Preset User

Change Parameter

MIDI 1st Byte - CONTROL CHANGE(MAX FREQUENCY CHANGES: 6 SECONDS)

MIDI 2nd byte	Status	MIDI 3rd byte	Legend
14	Digital Mix	0,1	Dry / Wet
7	Output Att	0,...,127	Master output volume (for all effects)

MIDI 2nd byte	Reverb	MIDI 3rd byte	Legend
15	Low Pass Input	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	H-Damp	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
17	L-Damp	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
18	PreDelay Rev	0,...,127	0,...,254 ms step = 2ms
19	PreDelay E.R.	0,...,127	0,...,254 ms step = 2ms
20	PreDelay F.R.	0,...,127	0,...,254 ms step = 2ms
21	Diffusion	0,...,127	0,...,127
22	Density	0,...,127	0,...,127
23	Decay	0,...,127	0,...,127
24	High Pass eff	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
25	Low Pass eff	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
26	Tuning	0,...,127	Volume Early Reflection
27	% Vol E.R	0,...,127	Volume Fast Reflection
28	% Vol F.R	0,...,127	tuning
29	% Vol Rev	0,...,127	Volume Reverb
30	% Vol Eff	0,...,100	Volume of Effect
31	% Vol Dir	0,...,127	Volume Direct Signal

MIDI 2nd byte	Reverse	MIDI 3rd byte	Legend
15	Time	0,...,100	0 / 100ms; Step 1ms
16	PreDelay	0,...,127	0 / 254 ms; Step 2ms
17	Density	0,...,127	0,...,127
18	High Pass eff	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
19	Low Pass eff	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
20	Revers Mode	0,1,2	Gated, Linear, Exp
21	% Vol Eff	0,...,127	Volume of Effect
22	% Vol Dir	0,...,127	Volume of Direct Signal

MIDI 2nd byte	St_Dly	MIDI 3rd byte	Legend
			1KHz,..,16KHz,Bypass; step 1/3 oct
15	Low Pass Input	0,... ,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	H-Damp	0,...,13	Bypass,50Hz,..,1KHz; step 1/3 oct
17	L-Damp	0,...,14	0 / 995ms; Step 5ms
18	Time L	0,...,199	0 / 995ms; Step 5ms
19	Time R	0,...,199	
20	Decay L	0,....127	
21	Decay R	0,...,127	0,...,127
22	High Pass eff	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
23	Low Pass eff	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
24	Link L+R	0,....1	OFF, ON
25	% Vol Eff	0,...,127	Volume of Effect
26	% Vol Dir	0,...,127	Volume of Direct Signal

MIDI 2nd byte	Pp_Dly	MIDI 3rd byte	Legend
15	Low Pass Input	0,... ,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	H-Damp	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
17	L-Damp	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
18	Time	0,...,199	0 / 995ms; Step 5ms
19	Decay	0,....127	0,...,127
20	High Pass eff	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
21	Low Pass eff	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
22	% Vol Eff	0,...,127	Volume of Effect
23	% Vol Dir	0,...,127	Volume of Direct Signal

MIDI 2nd byte	Mt_Dly	MIDI 3rd byte	Legend
15	Low Pass Input	0,... ,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	H-Damp	0,...,13	1KHz,..,16KHz,Bypass; step 1/3 oct
17	L-Damp	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
18	Time 1	0,...,199	0 / 995ms;Step= 5ms;Time Impulse 1
19	Time 2	0,...,199	0 / 995ms;Step= 5ms;Time Impulse 2
20	Time 3	0,...,199	0 / 995ms;Step= 5ms;Time Impulse 3
21	Decay 1	0,....127	0,...,127 Decay Impulse 1
22	Decay 2	0,...,127	0,...,127 Decay Impulse 2
23	Decay 3	0,....127	0,...,127 Decay Impulse 3
24	Volume 1	0,...,127	Volume Impulse 1
25	Volume 2	0,....127	Volume Impulse 2
26	Volume 3	0,...,127	Volume Impulse 3
27	PanPot 1	0,....127	PanPot Impulse 1
28	PanPot 2	0,...,127	PanPot Impulse 2
29	PanPot 3	0,....127	PanPot Impulse 3
30	% Vol Eff	0,...,127	Volume of Effect
31	% Vol Dir	0,....127	Volume of Direct Signal

MIDI 2nd byte	Chorus	MIDI 3rd byte	Legend
15	H-Damp	0,… ,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	L-Damp	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
17	Rate L	0,...,128	0,...,128
18	Rate R	0,...,128	0,...,128
19	Depth L	0,...,240	0,...,240
20	Depth R	0,...,240	0,...,240
21	High Pass eff	0,....14	Bypass,50Hz,..,1KHz; step 1/3 oct
22	Low Pass eff	0,....13	1KHz,..,16KHz,Bypass; step 1/3 oct
23	Phase Chorus	0,1	Direct/Invers
24	Type Osc	0,1	Sin, Ramp
25	Effect Mode	0,1,2	Stereo, Mono, Sum
26	% Vol Eff	0,...,127	Volume of Effect
27	% Vol Dir	0,...,127	Volume of Direct Signal

MIDI 2nd byte	Flanger	MIDI 3rd byte	Legend
15	H-Damp	0,… ,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	L-Damp	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
17	Rate L	0,...,128	0,...,128
18	Rate R	0,...,128	0,...,128
19	Depth L	0,...,240	0,...,240
20	Depth R	0,...,240	0,...,240
21	Decay L	0,...,127	0,...,127
22	Decay R	0,...,127	0,...,127
23	High Pass eff	0,....14	Bypass,50Hz,..,1KHz; step 1/3 oct
24	Low Pass eff	0,....13	1KHz,..,16KHz,Bypass; step 1/3 oct
25	Phase Chorus	0,1	Direct/Invers
26	Type Osc	0,1	Sin, Ramp
27	Effect Mode	0,1,2	Stereo, Mono, Sum
28	% Vol Eff	0,...,127	Volume of Effect
29	% Vol Dir	0,...,127	Volume of Direct Signal

MIDI 2nd byte	Tremolo	MIDI 3rd byte	Legend
15	H-Damp	0,… ,13	1KHz,..,16KHz,Bypass; step 1/3 oct
16	L-Damp	0,...,14	Bypass,50Hz,..,1KHz; step 1/3 oct
17	Rate L	0,...,128	0,...,128
18	Rate R	0,...,128	0,...,128
19	Depth L	0,...,240	0,...,240
20	Depth R	0,...,240	0,...,240
21	High Pass eff	0,....14	Bypass,50Hz,..,1KHz; step 1/3 oct
22	Low Pass eff	0,....13	1KHz,..,16KHz,Bypass; step 1/3 oct
23	Phase Chorus	0,1	Direct/Invers
24	Type Osc	0,1	Sin, Ramp
25	Effect Mode	0,1,2	Stereo, Mono, Sum
26	% Vol Eff	0,...,127	Volume of Effect
27	% Vol Dir	0,...,127	Volume of Direct Signal

MIDI 2nd byte	Leslie	MIDI 3rd byte	Legend
15	Low Pass Cyl	0,… ,25	50KHz,..,16KHz,Bypass; step 1/3 oct
16	High Pass Horn	0,...,25	Bypass,50Hz,..,1KHz; step 1/3 oct
17	Rate Cyl	0,...,128	0,...,128
18	Rate Horm	0,...,128	0,...,128
19	Depth Cyl	0,...,240	0,...,240
20	Depth Horn	0,...,240	0,...,240
21	Mode Amp Cyl	0,...,127	Modulation Amplitude Cyl
22	Mode Amp Horn	0,...,127	Modulation Amplitude Horn
23	Vol Cyl	0,...,127	Volume of Osc Cyl Signal
24	Vol Horn	0,...,127	Volume of Osc Horn Signal
25	% Vol Eff	0,...,100	Volume of Effect
26	% Vol Dir	0,...,127	Volume of Direct Signal

6. TECHNICAL SPECIFICATIONS

Analog Input section		
	Inputs	Analog variable gain, 1/4" TRS and XLR-F
	Input Impedance	44 kOhms
	Max. input Level	15 dBu (4.4V RMS)
	Sensitivity	-22 dBu (63mV RMS)
Analog Output section		
	Outputs	Analog variable gain, 1/4" TRS and XLR-M
	Output Impedance	<150 Ohms
	Max. output level	17 dBu on 600 Ohms (5.5V RMS)
Digital / Analog Interface		
	Amplitude Response	20 Hz - 20 kHz + 0.1 / - 1 dB
	Signal to Noise Ratio	90 dB (A wtg. / 20 Hz-20kHz)
	THD+N	0.03 % @ 1kHz -6 dB (VU-meter level)
	Group Delay	700 μS
	Sampling Frequency	46.875 kHz
	Conversion	1 bit Sigma-Delta
Digital		
	Processor Speed	12 Mips
	DSP Resolution	24×32 bits
	Control	Microprocessor
MIDI Section		
	Connections	Input/Output/Thru
	Sockets	5-poles DIN (female)
	Mode	Photocoupled
Power Supply		
	Connector type	3-pole IEC, grounded
	Type	Servo controlled, stabilized
	Mains supply	95-120V～/210-240V～,60-50Hz
	Power Rating	9 W
User Interface		
	Alphanumeric LCD Display	2×20 characters
	Keyboard	7 user keys / 5 LEDs
	VU meter	2×6 LEDs
Physical		
	Size	Standard 19" rack mounting
	Dimensions	483(W)×232.5(D)×44(H)mm(19"×9.3"×1.7")
	Net Weight	3.8kg(8.38lb)

7. WARRANTY

1. WARRANTY REGISTRATION CARD

To obtain Warranty Service, the buyer should first fill out and return the enclosed Warranty Registration Card within 10 days of the Purchase Date.

All the information presented in this Warranty Registration Card gives the manufacturer a better understanding of the sales status, so as to purport a more effective and efficient after-sales warranty service.

Please fill out all the information carefully and genuinely, miswriting or absence of this card will void your warranty service.

2. RETURN NOTICE

2.1 In case of return for any warranty service, please make sure that the product is well packed in its original shipping carton, and it can protect your unit from any other extra damage.

2.2 Please provide a copy of your sales receipt or other proof of purchase with the returned machine, and give detail information about your return address and contact telephone number.

2.3 A brief description of the defect will be appreciated.

2.4 Please prepay all the costs involved in the return shipping, handling and insurance.

3. TERMS AND CONDITIONS

3.1 ▲LTO warrants that this product will be free from any defects in materials and/or workmanship for a period of 1 year from the purchase date if you have completed the Warranty Registration Card in time.

3.2 The warranty service is only available to the original consumer, who purchased this product directly from the retail dealer, and it can not be transferred.

3.3 During the warranty service, ▲LTO may repair or replace this product at its own option at no charge to you for parts or for labor in accordance with the right side of this limited warranty.

3.4 This warranty does not apply to the damages to this product that occurred as the following conditions:

- Instead of operating in accordance with the user's manual thoroughly, any abuse or misuse of this product.
- Normal tear and wear.
- The product has been altered or modified in any way.
- Damage which may have been caused either directly or indirectly by another product / force / etc.
- Abnormal service or repairing by anyone other than the qualified personnel or technician.

And in such cases, all the expenses will be charged to the buyer.

3.5 In no event shall ▲LTO be liable for any incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.

3.6 This warranty gives you the specific rights, and these rights are compatible with the state laws, you may also have other statutory rights that may vary from state to state.

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